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ABSTRACT

This manual discusses pesticide safety and environmental considerations, pesticide toxicity, residue potential, pesticide formulations, and application techniques. In addition, descriptions of, and methods for controlling insects and related pests that attack cattle, sheep and goats, swine, horses and other equines, and poultry are given. These include mites, ticks, flies, lice, and vertebrate pests. A glossary of related terms is given. (BP)

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Applicator Training Manual for:

AGRICULTURAL ANIMAL PEST CONTROL

Christian M. Christensen, Extension Entomologist

UNIVERSITY OF KENTUCKY · COLLEGE OF AGRICULTURE · COOPERATIVE EXTENSION SERVICE
AGRICULTURE · HOME ECONOMICS · 4-H · DEVELOPMENT

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PESTICIDE SAFETY AND ENVIRONMENTAL CONSIDERATIONS

Pesticides are toxic substances which can cause severe illness or death if misused. Although many pesticide accidents occur from eating or drinking the product, especially among children and animals, applicators are more subject to injury or death from breathing a pesticide vapor or from getting a pesticide on their skin. Severe illness can also be caused by repeated exposure to small amounts of certain pesticides.

Most pesticides can enter the body dermally. Some pesticides are toxic enough to cause death by skin contact alone. Adequate protection from pesticide poisoning requires knowledge of the following: (a) symptoms of pesticide poisoning; (b) first aid procedures for pesticide poisoning by skin contact, inhalation, and swallowing; (c) how to protect the body with proper clothing, equipment, and cleanup measures; and (d) which kind of respiratory protective device to wear and when to wear it. The user is also responsible for (a) choosing the proper pesticide for the type of control needed; (b) the safe transport of the pesticide; (c) correct storage of pesticides away from children and unauthorized persons; (d) safe mixing and loading of the pesticide; (e) correct calibration of application equipment; (f) proper field, aerial, or animal application; (g) cleaning of equipment; and (h) safe disposal of excess pesticides.

Pesticides are also harmful to the environment if misused. They can injure plants and animals, leave illegal residues, and cause other types of damage. Damage is usually caused by (a) contact with non-target plants or animals; (b) injury to sensitive crops by persistent pesticides; (c) accumulation of pesticides in the food chain; (d) movement of pesticides off-target; and (e) pesticide contamination of water sources and bodies.

When planning a pesticide application, it is necessary to choose the pesticide that will do the least damage while giving good control. Pesticides can help the environment when chosen and used correctly.

PESTICIDE TOXICITY

Pesticides will protect animals from pests but since they can be toxic to warm-blooded animals as well as invertebrates, they must be applied properly to prevent injury. Individual animals and species can show sensitivity to certain pesticides. Poisoning is usually exhibited as excessive salivation, eye watering, defecation, urination, and muscle twitching.

Animals which are under stress or which will be put under stress should not be treated. Care should be used in treating young or smaller animals so that they will not be overdosed.

RESIDUE POTENTIAL

Label recommendations related to time intervals between application of pesticides and slaughter or marketing must be adhered to closely. Failure to do this can result in animals being confiscated and responsible individuals being prosecuted.

Pesticide Formulations

The pesticide formulation to be used must be taken into consideration when treating agricultural animals. Sprays are generally suited for treating most animals except in below-freezing weather. Pour-on or dust formulations are recommended under cold weather conditions. Oil sprays should not be allowed to penetrate the hair to the animal's skin.

PESTICIDE APPLICATION TECHNIQUES

When treating for external parasites, the insecticides should be put in contact with the pests. Thus spray pressures should be increased to ensure thorough wetting of the animal's hair. Power sprayers, knap-sack sprayers, compressed air sprayers, and rubbing devices (back and face rubbers) are satisfactory for applying liquid insecticides to agricultural animals. Dusts may be used in the same fashion or be applied by hand. Systemic insecticides which are picked up and transported throughout the animal's system are applied by pour-ons, spot-ons, sprays, feed additives, and in dipping vats and spray dip machines.

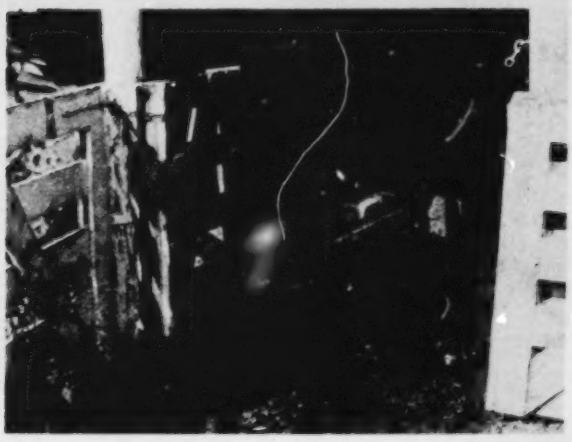

Fig. 1: Back rubber for cattle.

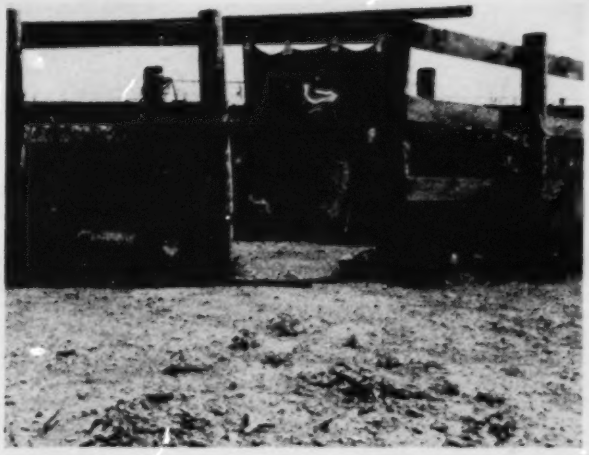

Fig. 2: Forced-use dustbag.

PESTS OF AGRICULTURAL ANIMALS

Agricultural animals are attacked by mites, ticks, flies, lice and vertebrate pests. These pests affect animal productivity by: killing animals, spreading disease agents, causing diseases, causing loss of blood, causing anemia, causing direct damage to animal or animal products, reducing weight gains, reducing milk production, lowering feed efficiency, and decreasing animal resistance to disease.

CATTLE

The insects and related pests that attack cattle include:

Horn Fly:

This small, blood-sucking parasite remains on the animal most of the time. Migration up to several miles occurs.

The female lays eggs in fresh individual cow droppings. The larvae develop here, and the adult fly then migrates to an animal host. The life cycle is completed in 7-14 days in the summer. The fly overwinters in the pupal stage in cold regions.

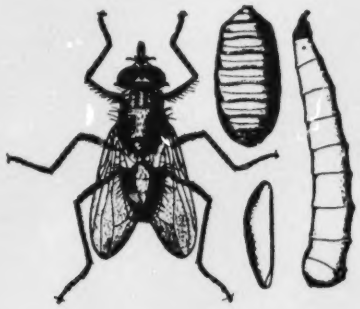

Fig. 3: Horn fly (egg, pupa, larva, adult).

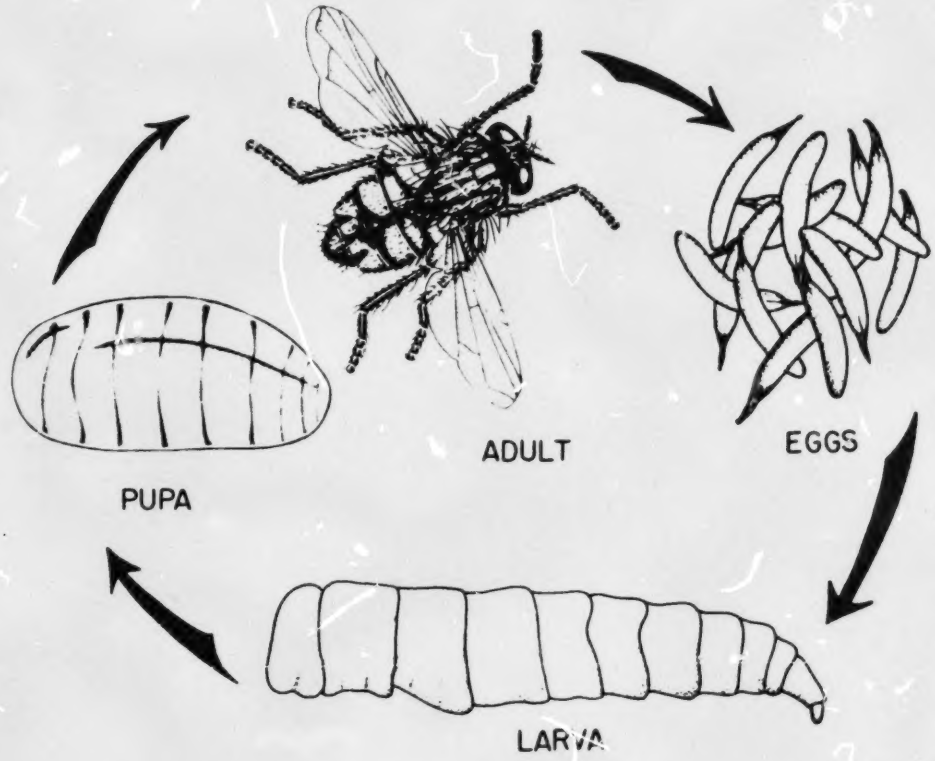

Fig. 4: Typical fly life cycle.

Control may be achieved by the use of dust bags, sprays, oilers, and mineral or feed additives. Self applicators are most effective when cattle are forced to use them daily. Feed additives and mineral supplements aid in fly control. Cattle sprayed by ground rigs or ULV sprays require periodic treatment. ULV sprays are satisfactory when cattle are grouped in open areas.

Face Fly:

Like the horn fly, the face fly develops in individual cattle droppings. The adult face fly clusters around the eyes and noses of animals. These flies feed on animal secretions, nectar, and dung liquids.

Fig. 5: Face flies on steer.

The life cycle from egg to adult is completed in about 2 to 3 weeks during summer months. The adult will migrate several miles to overwinter in buildings and other sheltered areas. Control is difficult due to the mobility of the flies and the short term residual of the insecticide. Daily forced use of dust bags, oilers, or hand treatment of animals have produced best results. Daily feedings of medicated minerals or rations may aid in control.

Heel Fly (Cattle Grub):

These flies lay eggs on the host animals. The larvae, as grubs, enter the skin at the base of the hairs. After migrating to the gullet or spinal canal, the grubs move to the loin area. Here they cut breathing holes through the hide and produce cysts (warbles). In from 5 to 6 weeks, the fully-grown, spiny grubs emerge through the breathing holes, drop to the ground, and pupate in the soil. Adults emerge in warm weather. The life cycle is completed in a year with about 8 or 9 months being spent as grubs in the host animals.

Animal systemic insecticides are most effective in grub control and are available as sprays, dips, backline treatments, and medicated feed supplements. To avoid host-parasite reactions, follow the treatment cutoff dates for the region. Post treatment symptoms may include bloat, inability to eat or take water, diarrhea, atoxia, excessive salivation, and partial hindquarter paralysis. Systemics cannot be used on milking dairy cattle.

DEC.
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
GRUBS STILL QUITE SMALL MOVE TOWARD BACK OF COW
GRUBS BEGIN TO CUT HOLES IN SKIN BUT VERY SMALL AT FIRST
GRUBS MORE ABUNDANT AND GROWING IN BACK SOME MATURE AND DROP OUT
ON GROUND GRUBS CHANGE TO PUPAE FROM WHICH HEEL FLIES DEVELOP
HEEL FLIES COME OUT AND LAY EGGS TERRORIZING COWS
EGGS HATCH AND GRUBS BORE DIG THROUGH SKIN CAUSING SORES WHICH COWS LICK
TINY GRUBS MOVE THROUGH TISSUES TO CHEST AND ABDOMINAL CAVITIES
IN SEPTEMBER AND OCTOBER ABUNDANT THERE VERY AND GROWN GRUBS FOUND IN WALLS OF GULLET OR WEASAND BECOME

Fig. 6: Cattle grub life cycle.

Biting and Sucking Lice:

Lice spend their entire life cycle on the animal. They hatch from eggs deposited on the hair and feed by sucking blood or biting. The total life cycle takes from 3 to 4 weeks. Louse populations are most prevalent during colder weather. Lice are chiefly transmitted by contact with infested animals.

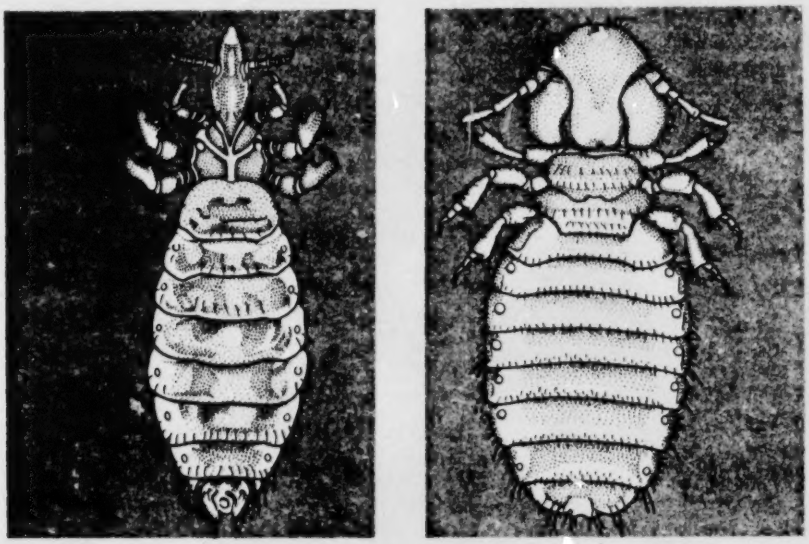

Fig. 7: Sucking louse (left) and chewing louse (right).

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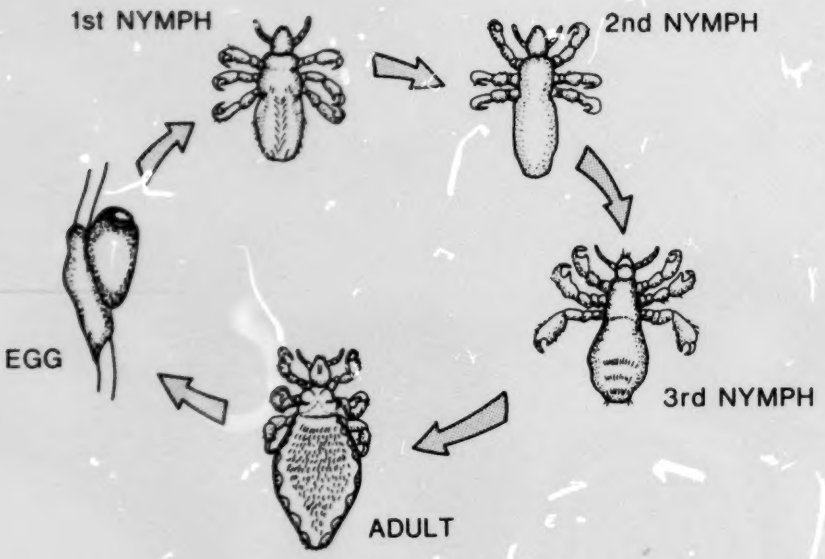

Fig. 8: Louse life cycle.

Fall applications of insecticides will reduce louse populations. A second application may be necessary 2 to 3 weeks later to prevent louse buildup during the winter. Dust bags and oilers may aid in louse control.

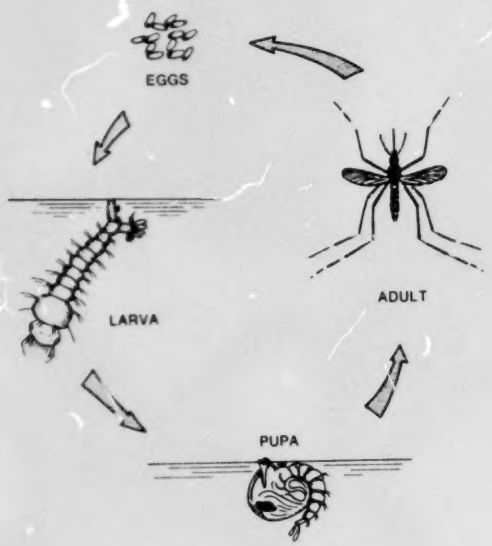

Fig. 9: Mosquito life cycle.

Mosquitoes:

Dense populations of mosquitoes feeding on the blood of cattle may affect the efficiency of meat and milk production. The female lays eggs on water in areas subject to flooding. There is great variation in the life cycles of mosquitoes, depending on the type and environment. Egg hatch usually occurs within 2-3 days. The larval stage in the water lasts about a week. The eggs, larval and pupal stages develop in water. Pupae generally change into adults within 2-3 days. The best means of control

is eliminating or minimizing water holding areas. Water which contains mosquito larvae and which cannot be eliminated should be treated by either adding top-feeding minnows or applying oils or an insecticide. Residual sprays or fogging for adult control can be applied to mosquito resting areas such as open barns and sheds, weeds, grass, trees and shrubbery.

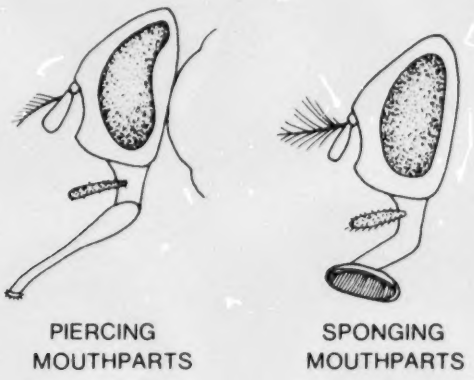

Fig. 10: Two basic types of fly mouthparts.

House Fly:

House flies are capable of transmitting many animal and human diseases. House flies feed with sponging mouth parts on manure and animal secretions. Large numbers of flies may annoy feedlot and dairy cattle, causing reduced efficiency of production. The egg develops to adult in a life cycle of about 7 to 14 days. Continuous development occurs throughout the year in warm climates.

Fig. 11: Stable fly.

Stable Fly:

This fly is similar to the house fly but has piercing mouth parts protruding bayonet-like from the head. The life cycle is about 14 to 21 days. Stable flies develop in decaying plant matter such as silage, rotting straw beddings, and aquatic vegetation. Continuous development occurs throughout the year in warm climates.

House and Stable Fly Control:

Sanitation is the key step in control of these flies. Disposal of animal wastes and organic debris is essential. Chemical control measures become more effective in conjunction with sanitation practices. Residual sprays should be applied to fly resting areas such as fences, feed bunks, buildings and vegetation. Repeat application as needed. Space sprays by ground or aerial application may also be effective in controlling populations of house flies. Fly development sources which cannot be managed by sanitation methods may be sprayed with a larvicide. However, frequent and prolonged use of insecticides, particularly larvicides, eventually result in fly resistance and loss of effective control. Local milk regulations determine what control measures may be used at dairies.

Cattle Ticks:

Ticks are important parasites of cattle because of their ability to transmit a number of blood diseases (e.g. anaplasmosis). In addition, loss of blood and injection of toxins during tick feeding affect animal health and subsequent weight gains and milk production.

Two families of ticks are recognized—hard ticks and soft ticks. Hard ticks have a heavy, leathery covering over much of the body and their mouth parts are visible when looking at the tick from above. The soft ticks are bloom-like in appearance and their body covering is more flexible than the hard ticks. Their mouth parts are not generally visible from above.

Fig. 12: The American dog tick, *Dermacentor variabilis.* **(U.S.D.A.)**

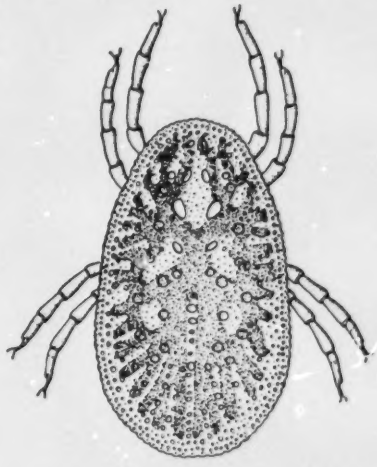

Fig. 13: The fowl tick, *Argas persicus,* **dorsal view.**

In general, hard ticks are found in unprotected environments such as old fields or brushy woodlots, whereas soft ticks are most generally found within animal burrows or cracks and crevices of animal shelters.

The life cycles of ticks may vary in length from several months to 6 to 8 years, depending upon the availability of hosts. Females begin egg-laying within 3 days to 3 weeks following feeding. Eggs are laid under leaves or other debris and hatch within 30 days. The 6-legged larvae ascend vegetation and infest passing animals. Some species remain on the host and pass from one developmental stage to

another, while other species drop to the ground following each blood meal and molt to the next stage. Fed females, of all tick species, drop to the ground for egg-laying.

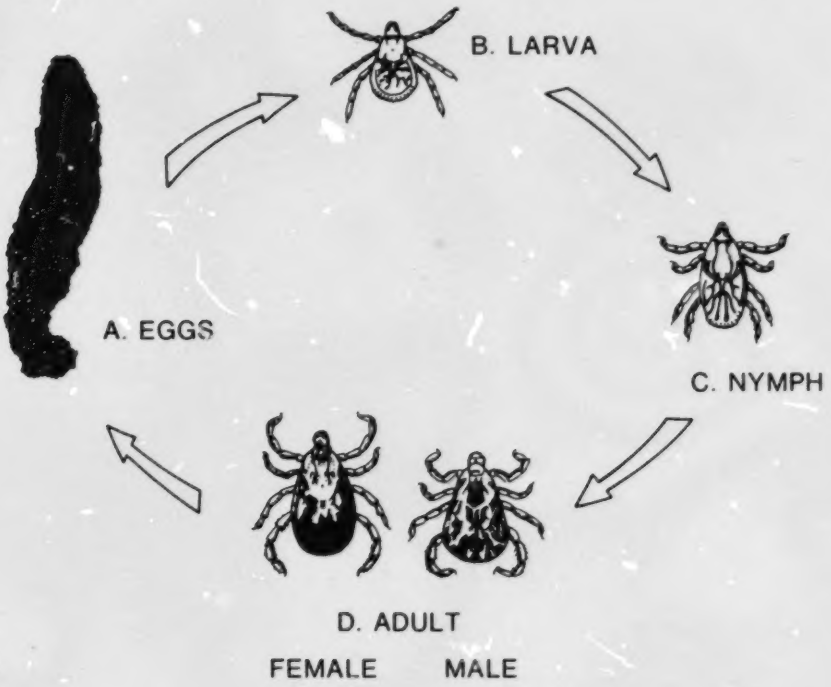

Fig. 14: Stages in Life Cycle of a Tick

There are four developmental stages in hard ticks—eggs, larvae, nymphs, and adults. The soft ticks vary slightly in that they may have several nymph stages. Larvae are 6-legged, nymphs and adults are 8-legged.

Proper identification of ticks is important for economical and effective control. Ear-infesting ticks—e.g., Gulf Coast and spinose ear ticks—require the application of pesticides directly to the ear as high-pressure sprays, dusts or oil-based solutions; whereas those species infesting the body require that high pressure sprays or dips be applied to the entire body. Because of the large number of species and the various developmental stages, control may be required at any time during the year. Seasonality and distribution vary with the species of tick.

Cattle Scabies:

Mites are tiny organisms related to ticks. There are three varieties of mite infestations called scabies: (a) psoroptic, or common scabies; (b) sarcoptic scabies; and (c) chorioptic scabies. The types of damage caused by these pests are dermatitis, excessive hair and water loss, severe weight loss, lack of milk, and predisposition of the animal to other diseases. Psoroptic and sarcoptic scabies are under federal quarantine regulations. Chorioptic scabies may be subject to state or local regulations.

Common (Psoroptic) Scabies:

Common scabies is the most serious form of cattle scabies, requiring immediate quarantine and treatment. The life cycle is completed in from 10 to 12 days. Common scabies are barely visible to the naked eye. Primary transmission is by animal contact.

Sarcoptic Scabies:

The sarcoptic scab mite is somewhat smaller than the common scabies mite. Mating and egg laying occur on the host and the life cycles of many species require 1-4 weeks.

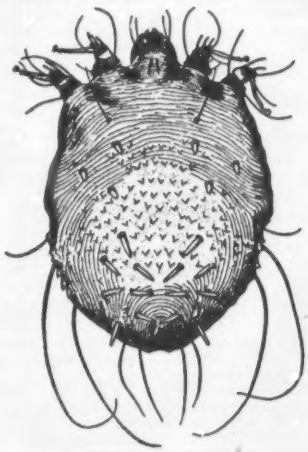

Fig. 15: Sarcoptic scab mite.

Because of quarantine regulations, diagnosis is very important and depends on accurate identification. Special techniques are necessary for identification of these mites. Sprays and dips are specified by state quarantine regulations are effective in control.

Mange Mites:

Sarcoptic mites tunnel into the skin and deposit eggs. The eggs hatch in 1-3 days and the larvae and nymphs either continue to tunnel or may crawl on the surface of the skin. The life cycle is about 2 weeks. Infestation can cause decreased efficiency. Individual infested animals should be treated by spraying or dipping in registered insecticides.

Screw Worm Fly:

The primary screw worm fly is a semitropical species occurring throughout the year in those regions. A large scale sterile male fly release program has greatly reduced the incidence of these pests in the United States. Since the initiation of the sterile male release program there has been no incidence of screw worms in Kentucky. This pest is parasitic, attacking only fresh wounds on domestic or wild animals and man. The mortality rate of animals attacked by this pest may reach 20%. Horn injuries, wire cuts, shearing wounds, tick bites, sores from needlegrass irritation, and umbilical tissue are sufficient to invite attack by the screw worm.

Control is now primarily by sterile male release. However, herd management should include dehorning, castrating, branding and parturition early enough to avoid the fly season. Additionally, all wounds should be treated promptly with screw worm smears.

The secondary screw worm and several species of the bottle and blow fly group may also infest wounds, but these species feed only upon the dead tissues. Still, the irritation and delayed healing of wounds cause decreased animal performance.

The life cycle of most of the screw worm fly complex is similar, requiring from 10 to 40 days, dependent upon climatic conditions.

Control of the secondary screw worm group would include wound treatment, sanitation (carcass and other animal organic matter disposal) and insecticide use as described for house flies.

SHEEP AND GOATS

The insects and related pests that attack sheep and goats include:

Sheep Ked:

The sheep ked adult is a wingless fly. The entire life cycle is spent on sheep and occasionally is found on goats. The nearly mature larvae are deposited on wool strands where they pupate almost immediately. Twenty-one days later the ked emerges and begins to take blood meals. It reduces efficiency and damages the hide, causing a condition called "cockle". Lambs on high energy rations in feed lots may not need treatment. Several insecticides are registered for use on these animals. Application may be done by spraying, dusting, or dipping vats. Treatment at shearing time gives the most efficient control.

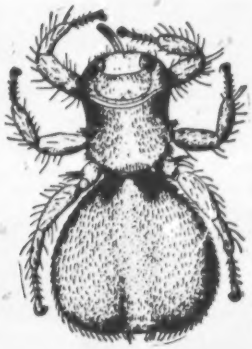

Fig. 16: The sheep tick, *Melophagus ovinus*. (Ky. Agr. Exp. Sta.)

Biting and Sucking Lice:

Sheep and goat lice cause intense skin irritation, resulting in reduction in quality and quantity of fleeces, and blood loss, resulting in anemia.

Life cycles take from 3 to 4 weeks and populations are more prevalent during colder weather. Transmission is by contact with infested animals. Insecticides applied as dips, sprays or dusts will provide louse control.

Sheep Scabies:

Refer to description and control recommended for scabies in "Cattle" section of this publication.

Nose Bot Fly:

Living fly larvae are deposited in the nostril openings of sheep. The larvae migrate to the head sinuses where development takes place. At maturity, they migrate back down the nasal passages and drop to the ground where they develop into adults. The life cycle varies from 1 to 2 generations per year. Migration of the larvae irritates the nasal membranes and causes secondary infections. The presence of nose bots is indicated by blood flecks in the nasal mucus and by sheep bashing their heads against feed bunks, fences, or the ground. No registered treatment is available.

Wool Maggot (Black Blow Fly):

This fly lays eggs in dirty wool or on wounds. After hatching, the fly maggots spread over the animal and feed on dead tissue under the fleece. Fly-infested sheep show restlessness and will bite irritated areas, resulting in fleece damage and wool loss. The life cycle of this pest takes about 2 weeks from egg to adult. Early shearing and medication of wounds before blow fly season is an effective preventive measure. Clipping and cleaning the fleece will help prevent infestations. Insecticide sprays, dips or smears are effective in controlling this pest.

SWINE

Insects and related pests of swine are:

Flies:

Refer to description and control recommendations under the "cattle" section of this publication.

Hog Lice:

The presence of hog lice may be indicated by excessive scratching and rubbing. This causes a reddening and thickening of the skin and results in a reduction of weight, particularly in young pigs. Heavy infestations may cause death. The louse is large enough to be seen easily and is found primarily in the areas of the shoulders and ears. Lice remain on the host at all times but are numerous during the winter months. The life cycle is about a month. Control is by dusts or sprays; also, insecticide granules may be applied to bedding for control.

Mange Mites:

Refer to section on sarcoptic scabies under "Cattle" section of this publication.

HORSES AND OTHER EQUINES

Insects and related pests that attack equines include:

Lice:

Refer to section under "Cattle" on biting and sucking lice for description. Damage includes loss

of hair, scurfiness of skin and irritability of animals. Animals may become unmanageable and may injure themselves. Sprays, dusts, washes and wipes are effective controls.

Horse Bots:

There are three main species of horse bots that attach their eggs to the hair of a horse. The eggs hatch and the larvae are then transferred to the animal's mouth, from which they migrate to the intestinal tract, where they remain until maturity. They are then eliminated with the dung and pupate in the soil, emerging in the early summer. There is a continuous generation, depending on temperature. Effective insecticide treatment is by drenching, feeding or bolusing, and oral paste.

Ticks:

In Kentucky most equine ticks are similar to cattle ticks. Refer to tick section under "Cattle" in this publication.

POULTRY

Lice:

Only biting lice infest poultry. They spend their entire life on the host. Most species complete a generation from egg to adult in 4-7 weeks. Louse transmission is by direct contact with infested animals. Lice are more commonly encountered during colder weather. Infested birds become restless and damage themselves by pecking at infested body areas. Decreased weight gain and egg production may result.

Treatment consists of the application of dusts or sprays onto the bird or the provision of self-treatment devices such as dust boxes.

Mites:

Various species of mites infest poultry. The common red mite feeds on blood during the night. The northern fowl and tropical fowl mites are found on birds at all times. Other mites may occasionally become a problem. Birds become irritated and anemic. If not controlled, dense populations may cause loss of weight, egg laying reduction, and death. The life cycle is 10-21 days in general. Mite infestations are transferred chiefly from bird to bird, including invasion of poultry houses by wild birds. Other means of spread are by infested feathers and poultry handling equipment, flats, manure, workers, and poultry feet.

The common red mite may be controlled by insecticide sprayed to the interior of the poultry house or directly on the birds. Northern and tropical fowl mites are controlled by sprays and dusts applied directly to the birds or by self-treatment dusting devices, similar to those used for lice. Mites which infest only the legs of poultry are controlled by dipping the birds in insecticide solutions.

Turkey Chiggers:

Chiggers are a problem on range birds, primarily turkeys. Infested turkeys may be downgraded in quality by lesions caused by chigger bites. Insecticide sprays and dusts may be applied to the ground. Repeated applications may be necessary.

Fowl Ticks:

Although several species of ticks may infest poultry, the most prevalent is the fowl tick, which is found associated with the housing of poultry. The fowl tick causes much the same kind of damage to poultry as poultry mites. The immature ticks attach to the skin, sucking blood and causing much irritation. Loss of blood in chicks can be great enough to cause death. Older birds become anemic and production is reduced.

The life cycle requires from 1 1/2 to 6 months, depending on temperature and food. The life cycle is similar to that of soft ticks on cattle. Birds are infested from cracks and crevices in poultry houses where these ticks hide. Infested birds also transmit ticks to other birds.

Control is similar to that recommended for the common red mite—spraying the poultry house (see "Mites", above).

Fleas:

The sticktight flea may occasionally become a pest on poultry in warmer regions. More serious infestations occur on chicks than on mature birds. Under extreme conditions, death of chicks and poults can be caused by flea infestations. The adult fleas are found attached to birds, chiefly around the head. The immature stages are found in the litter.

Fig. 17: The chicken sticktight flea, *Echidnophaga gallinacea*. (U.S.D.A.)

The sticktight, or southern chicken flea, prefers cool dry weather. The life cycle may be completed in 1 to 2 months. The females remain attached to the chickens, but the eggs are oviposited with enough force to fall to the ground, where they hatch in 2 to 14 days. The larvae feed on filth on the poultry house floor for 14 to 30 days, then spin silken cocoons for pupal transformation. Adult attachment to poultry occurs about 1 week after emergence.

Flea control is best achieved by spraying infested birds and the premises. The sticktight flea is not usually a problem under good sanitation conditions.

Bedbugs and Kissing Bugs:

These bugs may become serious in poultry houses where they hide during the day and feed on poultry at night. Their life cycle is about 4 to 6 weeks long. These insects may survive for long periods

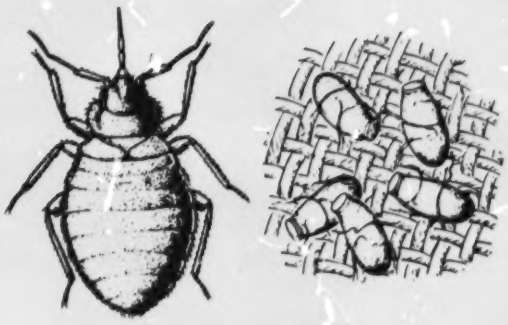

Fig. 18: Bedbug and eggs.

of time without feeding. Infested poultry suffer blood loss, which may result in anemia. Control of bedbugs and kissing bugs is similar to that for ticks. Spraying poultry houses and surrounding premises is the best method of control.

Flies:

Many types of domestic flies may be found on poultry ranches. These include the common house fly, little house fly, false stable fly, soldier fly, and the drone fly, all of which develop in poultry droppings. Various blow fly larvae develop in carcasses of dead birds and, under certain conditions, in the droppings.

The life cycles of these flies take from 1 to 3 weeks. Some flies may affect poultry by transmission of disease agents. Adults which disperse into the surrounding environment cause a nuisance problem to man and may transmit disease agents.

Good sanitation is important for successful fly control. Recommendations given for house and stable fly control under the "Cattle" section of this publication should be followed. Dead bird disposal and good water management are also essential to overall fly control.

VERTEBRATE PESTS – PREDATORS

Wild dogs generally do not attack livestock larger than calves and can be very deadly to sheep.

Smaller predators, such as foxes and eagles, may take poultry and the young of sheep, goats and hogs. Small predators, including badgers, racoons, skunks, weasels, opposums, housecats, rats, snakes, hawks, and owls, usually damage poultry and eggs.

Damage may be direct, where livestock and/or poultry are injured or killed by the predator. Also, livestock and poultry may be frightened by the presence of predators, resulting in stampeding which may injure or kill members of the flock or herd. Injuries sustained result in downgrading the market value of livestock and poultry.

Predator controls consist mainly of trapping, shooting and poisoning. Some species and certain control methods are regulated by state and federal laws. It is the responsibility of the applicator to know and follow appropriate regulations. Care should be taken to correctly identify the predator causing damage.

GLOSSARY

anemia	A condition in which the red corpuscles of the blood are reduced in number or deficient in hemoglobin.
aquatic	Growing or living in, or frequenting, water.
ataxia	Lack of normal coordination of parts; especially, inability to coordinate voluntary muscular movements.
bolusing	Medicating by means of a large pill.
cockle	A pucker or wrinkle in the skin.
dermatitis	Inflammation of the skin.
equine	Of, pertaining, or like a horse.
larvicide	An agent or preparation for destroying larvae.
piroplasmosis	An infectious protozan disease of horses.
residual	Of, or of the nature of, a residue; remaining substance.
space spray	Insecticide spray with short residual knockdown effectiveness for enclosed areas.
systemic	Of, or pertaining to, the general system, or the body as a whole.
toxin	A poison formed as a specific secretion product in the metabolism of a vegetable or animal organism and chemically allied to proteins.
ULV	Ultra low volume.
Vertebrate	Animal having a backbone, or spinal column.

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